

ATTACHMENT 3

Exelon Generating Company, LLC DRBC Docket No. D-69-210 CP (Final) Revision 12

Demonstration Operation & Monitoring Plan For the Joint Limerick Generating Station Water Supply Modification Demonstration and Wadesville Mine Pool Withdrawal & Stream Flow Augmentation Project

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I. Demonstration Operation Plan

1.0 INTRODUCTION

Exelon/Limerick Generating Station (“LGS”) has been conducting a demonstration of the pumping of water stored in the Wadesville Mine pool and the expanded use of Tamaqua’s Still Creek Reservoir water to augment the flow of the Schuylkill River during the season associated with flow and temperature restrictions on LGS’ use of the river for consumptive cooling makeup. The DRBC, in Revision 11 to Docket D-69-210 CP (Final), approved the Wadesville demonstration, which then started during the 2003 season and has been extended through the 2004 season. The Demonstration Operation & Monitoring Plan that corresponds with Docket Revision 12 will become effective on January 1, 2005. The existing Demonstration Operating and Monitoring Plan approved by the DRBC for implementation of Docket Revision 11 will be in effect for the remainder of 2004.

LGS now will conduct an expanded demonstration during the 2005, 2006, and 2007 seasons with an option to extend the demonstration to 2008. The expanded demonstration, approved by the DRBC in Revision 12 to the docket, will be another extension of the Wadesville and Still Creek augmentation demonstration supplemented by additional modifications to the water supply plan for LGS. In addition to continued augmentation, this demonstration will allow for increased withdrawals from the Schuylkill River for some or all consumptive cooling makeup at LGS after the 59° F temperature restriction is reached, as long as the river flow measured at Pottstown is higher than 560 CFS (or 530 CFS if only one unit at LGS is operating).

LGS will implement a Demonstration Operation & Monitoring Plan that includes a river flow withdrawal and augmentation strategy that is coordinated with a data collection and analysis program. The plan will enable the applicant to:

- Increase withdrawals of Schuylkill River water for consumptive cooling makeup at LGS during times when temperature restrictions would otherwise have prohibited the withdrawals.
- Control and account for the amount of minepool water and Tamaqua’s reservoir water to be released for augmentation of Schuylkill River flow.
- Determine the effect on the dissolved oxygen (DO) cycle pattern in Schuylkill River pool habitat downriver of Limerick Generating Station (LGS) during the demonstration period when Schuylkill River water is being consumed without compensatory replacement, i.e., when the flow of the Schuylkill River immediately below LGS is decreased by an amount being consumed for evaporative cooling.

The goal of the demonstrations is to provide LGS with additional operational flexibility and reliability in its use of water sources while, at the same time, to preserve and optimize the water resources of the basin.

1.1 Demonstration Project Description

1.1.1 General

The demonstration will occur during a six to seven-month period (approximately May through November) during the 2005, 2006, 2007, and optionally 2008 seasons associated with flow and temperature restrictions on the use of Schuylkill River water for consumptive cooling use for LGS. The prime period of interest to evaluate the impact of consumptive water withdrawals on DO is during high temperature and low river flow conditions.

During the demonstration period, subject to availability of the source and in order to optimize resources, LGS may make withdrawals of consumptive cooling makeup water for LGS in a manner that balances the needs to preserve resources, to address operational considerations and flexibility, and to maximize the restoration and monitoring fund. The general priority of the sources of consumptive cooling water makeup will be:

- Withdrawal from the Schuylkill River when unrestricted, all of the consumptive cooling water use at LGS.
- Withdrawals from the Schuylkill River, contingent on sufficient river flow, for some or all the consumptive cooling use at LGS without compensatory releases when the river temperature is higher than 59° F. (Fund Water)
- Withdrawals from the Schuylkill River equivalent to releases from the diversion to Perkiomen Creek. (releases for flow maintenance and recreation)
- Withdrawals from the Schuylkill River equivalent to the pumping volumes from the Wadesville Mine Pool.
- Withdrawals from the Schuylkill River equivalent to release volumes from Tamaqua's reservoir subject to yield limitations established for Tamaqua.
- Withdrawals from the Perkiomen Creek subject to sufficient natural creek flow.
- Withdrawals from the Perkiomen Creek augmented by withdrawals from the Delaware River via the diversion project.

Specific conditions on withdrawals of water from the Schuylkill River for consumptive water use by LGS during the demonstration are provided in Section 1.1.3.

1.1.2 Wadesville Mine Pool and Tamaqua Augmentations

LGS will retain Reading Anthracite Company (RAC), the current owner of the property that includes the Wadesville Mine, to provide operation and maintenance services for the Wadesville pumping and conveyance system. When required, RAC will operate the system in support of the pumping demonstration at a flow rate of up to 10,000 gpm, which represents approximately 40 percent of the average consumptive makeup requirement for LGS.

Wadesville mine pool water may be used in combination with other sources for consumptive use makeup when Schuylkill River water is restricted by flow or temperature conditions. Exelon will actively manage this resource to optimize the storage, yield, and timing of releases in conjunction with its other sources (e.g., the Still Creek Reservoir).

When computing the recognized augmentation, LGS will use:

- The actual pumping volumes available from Wadesville;
- The actual release volumes available from Tamaqua's reservoir;
- A 4-day time allowance for the water to travel from the mine pool/reservoir to the LGS intake;
- A 3 percent allowance for losses during transit; and
- 2 days of consumptive cooling withdrawals at LGS from mine water/reservoir augmentation after mine pumping/releases stop at the end of the season.

At the end of the season, pumping from the mine pool will be discontinued to allow the mine pool water to recover, by recharge from natural precipitation that infiltrates into the mine pool, to an elevation just below where active mining is taking place.

1.1.3 Schuylkill River Withdrawals

The following conditions on withdrawals of water from the Schuylkill River for consumptive water use by LGS during the demonstration shall apply:

(Note: Unless stated otherwise in this plan, numerical river temperature and flow trigger values are understood to mean 24-hour averages.)

- No temperature restriction on consumptive withdrawal will apply when Schuylkill River flow at Pottstown is >1,791 CFS.
- No temperature restriction for unaugmented consumptive withdrawal of up to 24 MGD (or 37 CFS daily average), which is approximately 60 percent of LGS' maximum consumptive water requirement, will apply.
- The normal restriction that there can be no consumptive water withdrawals when Schuylkill River flow is <560 CFS for 2-unit operation (<530 CFS for 1-unit operation) remains in place, except for the amount of LGS' augmentation of the Schuylkill River.
- Minimum flow to be maintained in East Branch Perkiomen Creek (EBPC) at the Bucks Road gage will be not less than 10 CFS, except for maintenance or emergency situations.
- Flow release to the EBPC will be temporarily adjusted higher as necessary to supply water for LGS, for tests associated with this monitoring program, and, if scheduled, requested at least 60 days in advance, and approved in advance by the Executive Director, to accommodate occasional recreational events in the EBPC.
- During specific testing periods, no temperature restriction on consumptive withdrawals of up to 42 MGD of unaugmented Schuylkill River flow, which is LGS' maximum consumptive water requirement, will apply. These test periods will be specifically approved by the DRBC.

- DRBC Executive Director approved withdrawal of up to 42 mgd for LGS consumptive cooling water needs without augmentation/makeup when the 24-hour average ambient water temperature is above 59°F and the 24-hour average river flow is below 1,791cfs at the Pottstown gaging station (but above 560 cfs).

1.1.4 Testing Periods

There are three kinds of tests that LGS anticipates performing during the demonstration period: null hypothesis, short-term, and long-term. These tests will be performed once LGS has established and analyzed a dataset. Specifically, LGS will examine the relationships between flow and DO, temperature and DO, and combined flow/temperature and DO. Based on these relationships, LGS will perform tests to confirm its predictions of the effects of consumption (non-augmented flow) on DO levels.

A null hypothesis test will be performed first. This test consists of reestablishing full consumptive use augmentation for short periods (2 to 7 days) of time and measuring the DO response. Based on the null hypothesis test and a review of collected data, LGS will perform specific short-term tests with no augmentation to understand the effect on DO at different flow and temperature conditions. These short-term tests will last from one week to one month. LGS will start with a shorter duration test and then gradually extend the length of the tests based on results. If, after the first year (2005) of the demonstration, the results of short term testing warrant a full (long-term) test with no augmentation, LGS will request permission from the DRBC to perform this test in 2006 to 2008. Prior to the start of a test, LGS will prepare and submit a brief work plan to the DRBC for its approval. This work plan will consist of the length of time of the test, flow and temperature conditions to be tested, method of analysis, and decision criteria.

If DO falls below the Docket trigger values of 5 mg/l average and 4.5 mg/l instantaneous, or if DO values are approaching the DO Docket criteria, or DO values are trending towards falling below the Docket criteria, LGS will notify the DRBC. The DRBC will arrange a conference call or meeting between Exelon, Pennsylvania Fish and Boat Commission, PADEP, and the DRBC to formulate recommendations to the Executive Director on any actions that should be taken.

1.2 Responsibilities

The following responsibilities are established for the conduct of this demonstration.

LGS

Overall management and control of the demonstration

Notification to the DRBC of the start of the demonstration and end of the demonstration season.

Notification to the DRBC of DO trends toward or below trigger values.

Installation of equipment to perform required monitoring

Collection, compilation, and submittal of monitoring data

Preparation and filing of interim and final demonstration reports

Operating in accordance with its LGS Makeup Water System Operating Plan for the duration of demonstration period subject to the provisions of the approved revised docket as reflected in this document, which include the use of mine pool water and other changes (e.g., expanded use of Tamaqua).

Reading Anthracite Company

Operation, inspection and maintenance of the pumping system installed at the Wadesville Mine

Inspection and maintenance of the discharge channel

Notifications to LGS of conditions that have affected or can potentially affect pumping or monitoring (flooding, repairs, etc.), regulatory actions, citizen complaints, evidence of water quality issues

Monitoring of the Wadesville discharge in accordance with its existing NPDES permit

Reporting of mine pool withdrawals in accordance with current DRBC requirements

DRBC

Reviewing, evaluating, and distributing monitoring data.

Developing water quality values relative to flow conditions; establishing appropriate monitoring parameters and operating plan conditions for withdrawals and the augmentation with mine pool water.

Reviewing and approving Test work plans.

1.3 Equipment Configuration

The Wadesville Mine shaft is the conduit through which water from the mine pool will be withdrawn. The top of the mine shaft is at approximately elevation 782 feet mean sea level (MSL) and its bottom elevation is at approximately elevation 46 feet MSL. A pump house at the shaft contains the equipment necessary for mine pool dewatering to support the demonstration and coal mining operations.

Two vertical turbine pumps are installed in the shaft with the suction casings at approximately 500 feet and/or 600 feet below the surface (at approximately elevation 282 feet MSL and/or 182 feet MSL). The pumps are rated to discharge at a rate in the range of 9,000 to 10,000 gpm total. The discharge from the pumps run from inside the pump house into a concrete energy dissipation chamber located adjacent to the pump house.

The discharge path from the chamber to the Schuylkill River consists of, in order:

- Metal and concrete sluiceways leading to a dry swale to East Norwegian Creek.
- East and West Norwegian Creeks combining into Norwegian Creek, running to the northern end of Pottsville.
- An underground conduit channeling the flow through Pottsville until it daylights on the southern end of the borough and discharges into the Schuylkill River (East Branch).

To measure the rate of the Wadesville discharge flow and record total gallons pumped, a flow meter, Marsh-McBirney or equivalent, is installed in the open flow channel. If the meter is out of service, RAC may utilize its existing method, which provides the basis for past reporting of withdrawals to the DRBC.

To take daily measurements of the water level in the mine shaft, a pressure transducer, Instrumentation Northwest or equivalent, is installed in the mine shaft. If the transducer is out of service, RAC may utilize its existing manual float and line method to measure water level.

Water quality monitoring instruments, YSI, HydroLab, TidBits, and/or equivalent, are deployed at the permanent monitoring stations (Wadesville, Still Creek, Schuylkill River). If an instrument is out of service, a portable hand-held unit may be used to measure the parameter.

2.0 PLAN OF OPERATION

2.1 Prerequisites

LGS notifies the DRBC of its intention to start the Demonstration.

2.2 Withdrawals, Augmentation, and Monitoring

RAC is subject to monitoring and reporting requirements of its applicable NPDES permit and reporting of discharge quantities to the DRBC on its Annual Water Withdrawal Report.

2.2.1 Annual Start of Demonstration

When Schuylkill River flow or temperature conditions are approaching the limits at which restrictions on consumptive cooling makeup use will be in effect (or if flow or temperature restrictions are already in place at the time of starting), LGS will notify the DRBC of its intention to start the demonstration. LGS will subsequently notify the DRBC the day the demonstration starts (if on a business day) or the first business day after it starts (if demonstration does not begin on a business day).

LGS will determine the optimal configuration of water augmentation sources and notify each party to start at a specific augmentation quantity. This may include instructing RAC to start operable pumps and maintain an optimized discharge flow at the maximum rate achievable (but no higher than 10,000 gpm), notifying Tamaqua to release water as allowable, releasing water from Bradshaw Reservoir, or a combination of these sources. RAC will report to LGS the date and time of starting of the pumps at Wadesville, and the discharge flow achieved.

LGS will document the date when the demonstration officially has started. Accruing of augmentation credits and increased withdrawals from the Schuylkill River when its use is restricted by temperature will not begin until the formal start of the demonstration.

2.2.2 During Demonstration

During the pumping demonstration, LGS will operate in accordance with its existing approved Operating Plan subject to the provisions of the approved revised docket as reflected in this document, which include the use of mine pool water, the expanded use of Tamaqua, and increased withdrawals from the Schuylkill River when consumptive use was previously restricted by temperature.

During the demonstration, LGS will apply the criteria stated in Section 1.1.3 when making withdrawals of water from the Schuylkill River for consumptive water use by LGS.

RAC will pump during the demonstration period as requested by LGS. RAC will be responsible to perform preventive and corrective maintenance to maximize reliable pumping system operation. Tamaqua will release water for augmentation during the demonstration period as requested by LGS subject to established yield limitations (DRBC Operating Rule Curve) on the Tamaqua reservoir.

When conducting the demonstration, LGS will optimize the use all of its resources listed in Section 1.1.1 by balancing the needs to preserve resources, to address operational considerations and flexibility, and to maximize the restoration and monitoring fund.

Monitoring of parameters and conditions will be performed throughout the demonstration period in accordance with this plan. LGS will compile the monitoring data and make weekly reports to the DRBC. The collection and reporting of Schuylkill River DO, pH, and temperature monitoring data will not be necessary when the river flow at Pottstown is $>1,791$ CFS or the river temperature is $< 59^{\circ}\text{F}$. If necessary, due to expected or actual adverse weather/river conditions, LGS may temporarily remove water quality monitoring equipment and will reinstall the equipment when conditions are safe.

LGS may withdraw consumptive makeup water from the Schuylkill River to include the mine water and Tamaqua reservoir augmentation flows, allowing for:

- A 4-day travel time for the water augmentations to reach its intake structure at the Schuylkill River Pump House;
- A 3 percent in-transit loss in the flow quantity; and
- 2 days of consumptive cooling withdrawals at LGS after mine pumping/reservoir releases stop at the end of the season.

At any time from DRBC's approval of this Demonstration Plan, LGS may elect to request releases from Tamaqua or Wadesville subject to established yield limitations. The Schuylkill River augmentation from the Tamaqua and Wadesville sources would be added to any diversion project water augmentation of the Schuylkill River via Perkiomen Creek to establish the total Schuylkill River augmentation. Tamaqua will report to LGS the quantity of its daily releases made on behalf of LGS. During the demonstration, monitoring requirements for Tamaqua releases will be in accordance with this Demonstration Plan.

Planned releases from Bradshaw and Still Creek reservoirs for recreational events on the East Branch Perkiomen Creek and Little Schuylkill River will be made annually, conditions permitting. Stakeholder groups, such as the Schuylkill River Greenway Association and Perkiomen Watershed Conservancy, will be asked in the spring to submit a request for planned releases. LGS will determine whether the requests for releases can operationally be met with respect to time, quantity, and length. LGS will submit a plan and request authority from the DRBC to implement each planned release. A copy of this plan will be provided to PFBC and PADEP. It is assumed that recreational releases are pre-planned events and limited in number.

In order to maintain operational flexibility, LGS also may withdraw water from Perkiomen Creek, augmented if necessary by water from the diversion project, and collect daily data on withdrawals in accordance with the existing LGS Operating Plan.

LGS will collect data on total consumptive water use, consumptive use addressed by the fund fee, and releases from each source (i.e., Wadesville, Still Creek, the diversion system through Perkiomen pump house, and the diversion system via release through Perkiomen Creek). LGS will tally and average the data over a calendar month. Overages of water from the combined consumptive cooling augmentation sources will be carried over into the next calendar month and adjustments made in the releases as appropriate.

Off-normal conditions will trigger certain actions as detailed in Section 2.3.

If, at any time during the demonstration period, the DRBC requires LGS to shut down all or any part of the demonstration, DRBC will contact:

- (During normal business hours and non-emergency conditions) LGS Makeup Water System Manager (name and phone number provided to DRBC)
- (During non-business hours and emergency conditions) the LGS Control Room Supervisor (phone number provided to DRBC)

The above LGS personnel will be responsible to notify the responsible party or make operational changes implementing the required shutdown.

The following agencies have authority to contact the LGS Control Room Supervisor and temporarily suspend specific parts of the demonstration:

- PADEP Pottsville Mining Office
- PADEP Harrisburg
- PADEP Wilkes-Barre
- PADEP Norristown
- Pottstown Water Department
- Philadelphia Water Department
- DRBC
- PA Fish & Boat Commission

The DRBC will authorize resumption of all or the suspended parts of the demonstration.

2.2.3 Annual End of Demonstration

When Schuylkill River flow or temperature conditions are approaching the limits at which seasonal restrictions on consumptive cooling makeup use are no longer in effect, LGS will prepare to end the demonstration for the year. LGS will notify RAC to shut down both pumps at Wadesville and/or notify Tamaqua to discontinue releases from the reservoir, and allow for two additional days of consumptive cooling use from the date when pumping/releases have stopped.

Upon ending the demonstration, LGS will:

- Document the date when the demonstration officially has ended for the year and notify the DRBC.
- Revert to the use of the approved pre-demonstration LGS Operating Plan.
- Cease accrual of augmentation credits and increased withdrawals from the Schuylkill River when flow and temperature restrictions have ended.

2.3 Off-Normal Conditions and Required Actions

In the event that any of the conditions identified below occur during the demonstration, LGS will require that the action associated with each condition be performed. If needed, DRBC will develop additional conditions based on monitoring data. These conditions may include additional trigger values that could require modifications to monitoring and/or mine water augmentation.

Condition 1: Pumping from the mine pool is interrupted.

Action 1: RAC will notify LGS and perform corrective maintenance as necessary. For interruptions lasting longer than 24 hours, LGS will verbally notify the DRBC (during the next business day if condition occurs after normal working hours). LGS also will report interruptions in its weekly report to the DRBC. LGS will make adjustments to the consumptive cooling makeup flow as necessary to compensate for the loss.

Condition 2: Monitoring results indicate significant water quality or related issues.

Action 2: LGS will notify DRBC in a timely manner and recommend specific actions depending on the nature of the issue.

Condition 3: The public identifies adverse effects.

Action 3: Upon notification, LGS will notify DRBC in a timely manner and recommend specific actions depending on the nature of the conditions.

3.0 DEMONSTRATION OFF-SEASON

3.1 Monitoring

Collection of data after annual suspension of the demonstration will be limited to water levels in the mine shaft, rainfall data, and specific monitoring events specified in this Demonstration Plan.

RAC will continue with monitoring of mine pool level, and may resume pumping after the pool recovers to pre-demonstration levels, as necessary to support active mining.

4.0 EVALUATION AND REPORTING

4.1 Evaluation Criteria

The following criteria will be used to evaluate the demonstration of the capability to augment Schuylkill River flow with water contained in the Wadesville Mine pool and Tamaqua reservoir:

- Water quality is maintained to the satisfaction of the DEP and DRBC.
- Mine pool and reservoir water elevations are managed within a satisfactory range.
- During the period of historic flow and temperature restrictions in the Schuylkill River, LGS demonstrates operational flexibility to use the various augmentation sources.

- If any adverse effects of the demonstration are identified, means to mitigate the effects have been identified.

The following criteria will be used to evaluate the demonstration of increased withdrawals (i.e., those above augmented flow quantities) from the Schuylkill River when the historic temperature restriction would have been in effect:

- Water quality criteria for DO are met in the Schuylkill River downriver of LGS with withdrawals during the demonstration period. When minimum daily average DO values of 5.0 milligrams per liter (mg/l) and minimum DO values of 4.0 mg/l are met in-river 99 percent of the time, DO water quality criteria are deemed to be met.
- There is no statistical correlation between LGS' increased withdrawals and DO levels in the river (see section 1.1.4).
- There are no or de minimis changes in numerical DO depressions diurnally even if increased withdrawals and DO are correlated.

4.2 Evaluation and Reporting

4.2.1 Evaluation

Relationships between temperature, flow, pH, and DO (represented as percent saturation) may be examined using multiple regression analysis. Multiple regression analysis is used to explain as much variation observed in the response variable (i.e., DO) as possible, while minimizing unexplained variation from "noise". In addition to temperature, flow, and pH, temporal variables including Julian day or collection hour, may be included into the model as explanatory variables. Interaction effects of these variables may also be considered in the model. The most important variables will be selected based on stepwise, or similar procedures; explanatory variables that do not improve the fit of the model will be excluded from the analysis. Additional models may be developed based on subsets of the data to improve relationships between variables. Potential subsets of the data include: data collected during low flow conditions (e.g., below 560 CFS) or data collected during photosynthetically active periods versus data collected during photosynthetically inactive periods. Appropriate subsets of the data and the selection of explanatory values will be determined based on preliminary data reviews.

Fourier analysis may be used as an additional tool to evaluate the cyclical (diurnal) behavior of DO during the demonstration period. Fourier analysis is a form of multiple regression analysis that decomposes a series into a finite sum of trigonometric components. The model developed from Fourier analysis may be an effective tool for predicting the behavior of the DO concentrations through the demonstration period. Inter-annual comparisons may also be made between Fourier models developed in each demonstration period.

These analyses or other alternative analytical techniques will be selected based on preliminary reviews of the data. The most appropriate technique to examine relationships between DO and temperature, flow, pH, or other explanatory variables will be selected based on the outcome of this data review.

Additionally, the positive effects of cumulative restoration efforts will be qualitatively evaluated to determine if these effects offset any incrementally depressed DO levels if found associated with consumptive water use by LGS.

4.2.2 Meetings

Exelon and DRBC will meet at least twice each year to discuss the progress of the project. In addition, if DO falls below the Docket trigger values of 5 mg/l average and 4.5 mg/l instantaneous, or if DO values are approaching the DO Docket criteria, or if DO values are trending towards falling below the Docket criteria, LGS will notify the DRBC. The DRBC will arrange a conference call or meeting between Exelon, Pennsylvania Fish and Boat Commission, PADEP, and the DRBC to formulate recommendations to the Executive Director on any actions it should be taken. .

4.2.3 Reporting

LGS shall submit to the DRBC (and other key stakeholders) annual interim demonstration project assessment reports by January 15 of the year following each year that the demonstration project is conducted, and a final demonstration project report by April 30, 2008 (or April 30, 2009 if the optional year 2008 is implemented). Reports about the water quality results and the projected correlation of those results to low Schuylkill River flow (e.g., Q₇₋₁₀) conditions will be provided in the final report.

5.0 RESTORATION AND MONITORING FUND

LGS will set up and maintain a restoration and monitoring fund that is intended for use in funding projects designed to improve the water quality of the Schuylkill River watershed.

5.1 Calculation and Reporting

LGS will make quarterly calculations and annual contributions to the restoration and monitoring fund for the period of the demonstration. Using the methodology provided in Appendix 1 to this Demonstration Plan, LGS will calculate the amount of the contribution for each period as a function of the decrease in LGS' augmentation requirements, measured in 1000 gallons increments. For each 1,000-gallon increment, LGS will contribute six cents (\$0.06) to the fund.

LGS will report weekly on water quantity and quality, quarterly on calculated contributions, and annually on the contributions to the fund. This information will be summarized as part of the interim reports and in the final report.

5.2 Use of Restoration and Monitoring Fund

In conjunction with the demonstration, Exelon proposes to develop a method of funding for environmental restoration projects of third party organizations that are consistent with Exelon's interest in enhancing the watersheds affected by this demonstration. The amount of funding will be based on the amount of reductions in consumptive cooling use augmentation quantities from levels that would have been required if the temperature restrictions were in place. No monies will be committed or extended that have not been accrued in the fund.

II. Demonstration Monitoring Plan

1.0 Introduction

This monitoring plan will provide the data necessary to:

- Assess the impacts of this project to the water resources related environment of the Schuylkill River, Little Schuylkill River, Still Creek, the East Branch Perkiomen Creek, Perkiomen Creek, and Norwegian Creek as required by the above-referenced docket.
- Collect information on in-river levels of dissolved oxygen (DO) at selected pool habitat locations below LGS.
- Determine the effect of uncompensated water withdrawals at Limerick on in-river DO concentrations. Essentially, we will seek to prove the null hypothesis that consumptive water withdrawal at Limerick does not have a substantial effect on downriver DO conditions.

The water supply modification demonstration project involves increased consumptive cooling loss makeup withdrawals from the Schuylkill River at LGS under specified conditions concurrently with augmentations of river flow with up to 10,000 gpm from the Wadesville Mine pool, Tamaqua releases, and Perkiomen Creek augmentations. For the part of the demonstration involving non-compensated withdrawals, DO is the key parameter of interest. In addition, temperature is of interest in order to calculate percent saturation for DO and is of particular interest in Black Rock Pool, which receives a thermal discharge. Also, pH is of interest to evaluate the importance of photosynthesis.

This plan is based on direction obtained during inter-agency/applicant meetings held on June 9, 2003, July 15, 2004, and September 27, 2004; a DRBC/applicant meeting on June 26, 2003; and 2 years of monitoring history (Wadesville and Still Creek). This monitoring plan augments the LGS Makeup Water System Operating Plan and supersedes the Demonstration Operation and Monitoring Plans associated with Revision 11 of DRBC Docket No. D-69-210 CP (Final).

2.0 Monitoring Parameters, Frequencies, and Locations

The parameters to be monitored, the frequency at which they will be evaluated, and the locations at which the monitoring will be conducted, are provided below. The DRBC may develop trigger levels for additional monitoring and/or modification of withdrawals and augmentations. These changes will be added to the Demonstration Operation Plan.

The selection of Schuylkill River DO monitoring points was based on locations previously approved by PFBC and DRBC in the 1980s and the need to collect representative data, the practicality of collecting data, security, and access. The applicant will perform up to three surveys during specific water conditions to confirm the appropriateness of these locations. If locations need to be adjusted, new locations will be selected, again, based on balancing and optimizing the need for representative data, practicality, security, and access.

Prior to approval of the Demonstration Operation and Monitoring Plan, dissolved oxygen monitoring protocols for the LGS intake, Black Rock Pool, and Norristown Pool will be presented to the DRBC for their concurrence.

DO monitoring will begin before the demonstration starts in 2005 and following years and the Schuylkill River temperature is greater than 59°F.

The proposed monitoring is summarized in Appendix 2, indicating monitoring parameters and frequencies by location.

Water quality sampling and analysis will be performed according to PADEP or EPA-approved methods. Sampling will consider the approximately 4-day time-of-travel from Pottsville to Pottstown under low flow conditions.

Biological sampling will employ methods used previously by the PA Fish and Boat Commission, or, in the case of the EBPC, equivalent methods used in previous years of monitoring.

Biological sampling and associated water quality monitoring will be performed when flow conditions permit sampling.

3.0 Specific Requirements for the Pottstown Intake Monitoring

1. Testing at the Pottstown intake will occur on the first occasion when the Pottstown USGS gage daily mean flow in the Schuylkill River is below 840 CFS for four consecutive days and there have been releases from Wadesville during those same four days.
2. Tests that are twice per week will be analyzed with a 48-hour turnaround.
3. Testing will be suspended if the Pottstown USGS gage daily mean flow in the Schuylkill River goes back above 840 CFS, and will restart after conditions in Step 1 are again met.
4. After two weeks of test results, the Pottstown Borough Authority and LGS will evaluate the test results and make an informed decision on whether or not to adjust the testing requirements. If the Pottstown Borough Authority and LGS collectively decide that the testing requirements should be adjusted, the DRBC will be notified of those changes.

4.0 Data Distribution and Reporting

Annually LGS will notify the DRBC of its intention to start the demonstration. LGS will subsequently notify the DRBC the day that the demonstration starts (if on a business day) or on the first business day after it starts (if on a non-business day). At the conclusion of each demonstration period, LGS will document when the demonstration has effectively ended for the year and will notify the DRBC.

When the monitoring results indicate significant water quality or related issues or when the public notifies LGS of adverse effects, LGS will notify DRBC in a timely manner and recommend specific actions depending on the nature of the issue.

LGS will transmit operational and monitoring data to DRBC weekly.

LGS will report quarterly on water quantity and calculate the contributions to the restoration and monitoring fund. This information will be included as part of the weekly reports, as applicable. This information will be summarized as part of the interim annual reports and in the final demonstration project report.

LGS or its laboratory contractor will provide Pottstown intake monitoring data to Pottstown Water Department upon receipt. After 2 weeks of testing when Schuylkill River flows are below 840 cfs at the

Pottstown gage, LGS will notify the DRBC if the Pottstown Borough Authority and LGS have collectively decided to adjust the monitoring requirements.

Exelon will notify the DRBC when DO monitoring trends approach 5 mg/l daily average or 4.5 mg/l instantaneous minimum at any of the downstream monitoring sites.

LGS will transmit (ten hard and two CD-ROM electronic copies for the DRBC) of the annual demonstration assessment report to the DRBC (and other interested stakeholders) by January 15 of the year following each year that the demonstration is conducted. The final demonstration project report will be submitted to DRBC (and interested stakeholders) by April 30, 2008 (or April 30, 2009 if the optional year 2008 is implemented).

Exelon will submit requests to make flow increases in the EBPC and in Still Creek to support short-term recreational events at least 60 days in advance of the proposed release dates.

Exelon and DRBC will meet at least twice a year to discuss the progress of the project. Unless alternate arrangements are agreed upon with the Executive Director, the meetings will take place in connection with submittal of the annual report and during July.

APPENDIX 1

Restoration and Monitoring Fund Fee Calculation

The following table shows cases of 24-hour average flows (collected from the USGS gage station at Pottstown) and temperatures (collected from the LGS-operated monitor located at the Linfield Road bridge), when Restoration and Monitoring Fund (“fund”) fees will or will not apply to LGS. The decision criteria are based on the periods when augmentation would have been required under LGS’ pre-demonstration Makeup Water System Operating Plan, but the augmentation requirements have been reduced or eliminated by allowing LGS to continue making withdrawals from the Schuylkill River during those periods of the demonstration.

Case	Flow (CFS)	Temperature (°F)	Months	Fund Fee Applies?
1	>1,791	>59	April, May, June	No
2	>1,791	>59	July to End of Pumping Season	Yes
3	>560*	<59	Entire Pumping Season	No
4	>560* and <1,791	>59	Entire Pumping Season	Yes
5	<560* **	Any	Entire Pumping Season	No

Note: Both flow and temperature criteria need to be satisfied for each case.

*Or 530 CFS when only one unit operating at LGS

**No un-augmented consumptive use withdrawals permissible at this river flow

As indicated in the above table, LGS will make contributions to the fund in Cases 2 and 4, when the river temperature below LGS is higher than 59°F, as follows:

- For Case 2 (no temperature restriction on LGS’ withdrawals during the demonstration), the calculation for the fund contribution will be based on the total amount of un-augmented water equivalent to LGS’ total actual consumptive cooling makeup requirements, up to a maximum of 42 MGD, for each included daily period from July 1 to the end of the pumping season.
- For Case 4 (limited temperature restriction on LGS’ withdrawals during the demonstration), the fund calculation will be based on up to 24 MGD for each included daily period during any month of the pumping season. The 24 MGD maximum limit may be increased or eliminated after 2005 by the DRBC Executive Director.

The daily total LGS consumption is recorded each day and summarized in a weekly report to the DRBC, as required by the current LGS Makeup Water System Operating Plan.

When there is an inflection point in flow or temperature during a day that causes a shift from one case to another, the fee calculation for the day will be prorated using six four-hour increments (12 midnight to 4 a.m., 4 a.m. to 8 a.m., etc.) in conjunction with the recorded daily total consumption. The rolling average flows and temperatures recorded at 12 midnight, 4 a.m., 8 a.m., 12 noon, 4 p.m., and 8 p.m. will be used for purposes of daily prorating.

The fund fee will be calculated based on \$0.06 per thousand gallons, which is equal to \$60.00 per million gallons.

Calculation Methodology for Case 2

Use *Formula 1* to calculate C_{LGS} (the Total Daily LGS Consumption in MGD):

(Note: no change from the current method used by LGS and reported weekly/quarterly)

$$C_{LGS} = M - B$$

Where:

M = Total Daily Makeup from all sources to LGS (MGD)

B = Total Daily Releases from LGS to the Schuylkill River (MGD)

Use *Formula 2* to calculate C_{SR} (the Total Schuylkill River Consumption in MGD):

$$C_{SR} = C_{LGS} - [0.97 \times (A_W + A_{SC} + A_{PC})] - C_{PC}$$

Where:

C_{PC} = Total Daily Consumptive Makeup from Natural Perkiomen Creek flow (MGD)

A_W = Total Daily Wadesville Augmentation (MGD)

A_{SC} = Total Daily Still Creek Augmentation (MGD)

A_{PC} = Total Daily Perkiomen Creek Augmentation (MGD)

0.97 allows for 3 percent in-transit losses of augmentation flow

Use *Formula 3* to calculate F (the Restoration and Monitoring Fund Fee in \$):

$$F = \$60.00 \times C_{SR}$$

The following example is given to illustrate how the daily fund fee for Case 2 will be calculated:

Example 1 (for Case 2):

Given: It is a day in September when, during the previous day, the river flow was >1,791 CFS, the river temperature was >59°F, and the recorded total daily LGS consumption was pre-calculated as 40.0 MGD. The only augmentation that LGS provided was the required minimum augmentation of the East Branch Perkiomen Creek at 10 CFS (or 6.463 MGD).

Calculate the Fund Fee (F):

Formula 1: $C_{LGS} = M - B = 40.0$ MGD (using the current method used by LGS and reported weekly/quarterly)

Formula 2: $C_{SR} = C_{LGS} - (0.97 \times A_{PC}) = 40.0 - (0.97 \times 6.463) = 40.0 - 6.269 = 33.731$ MGD

Formula 3: $F = \$60.00 \times 33.731 = \underline{\underline{\$2,023.86}}$

Note: If it were a day in May instead of September, then no fee would apply, since no augmentation would have been required under the old operating rules. That would be an example of Case 1.

The following example is given to illustrate how the daily fund fee for Case 4 will be calculated:

Example 2 (for Case 4):

Given: It is a day in June when, during the entire day, the river flow was <1,791 CFS but >560 CFS, both units were operating, the river temperature was >59°F, and the recorded total consumption was 35.5 MGD. Under these conditions during the demonstration, LGS may withdraw its consumptive use from the Schuylkill River without augmentation, up to a maximum of 24 MGD. Augmentation was provided for the amount of LGS consumptive use above 24 MGD.

Calculate the Fund Fee (F):

Formula 3: $F = \$60.00 \times 24 = \underline{\$1,440.00}$

Notes:

1. If the river temperature were <59°F instead of >59°F, then no fee would apply, since no augmentation would have been required under the old operating rules. That would be an example of Case 3.
2. If the river flow were <560 CFS instead of >560 CFS, then no fee would apply, since low river flow would preempt the temperature restriction (i.e., continued withdrawals not permissible), and LGS would be required to provide augmentation for its entire recorded total daily consumption using Wadesville, Still Creek, and/or the Diversion System. That would be an example of Case 5.

The following example is given to illustrate how a prorated daily fund fee will be calculated:

Example 3 (Prorated Fee):

Given: It is a day in late April when the rolling average river flows at 12 midnight, 4 a.m., 8 a.m., and 12 noon were >1,791 CFS and, for 4 p.m. and 8 p.m., the rolling average river flows were <1,791 CFS but >560 CFS. Both LGS units were operating, the river temperature was >59°F all day, and the recorded total consumption was 36.0 MGD. Under these conditions during the demonstration, Case 1 (no fund fee) would apply for the first four increments and Case 4 (fund fee) would apply to the last two increments.

Calculate the Fund Fee (F):

$Csr = 36MG \times (2 \text{ increments} / 6 \text{ increments}) = 12MGD$

12MGD is less than Case 4 maximum of 24MGD so

Formula 3 $F = \$60 \times 12MG = \underline{\$720.00}$

No augmentation would be needed.

APPENDIX 2 Monitoring Parameters and Frequencies by Location

LOCATION	PARAMETER	FREQUENCY (note 1)
Wadesville Pumphouse	TDS	monthly
	Conductivity	⁶ daily or in accordance with Early Warning System
	Flow	⁶ daily
	TOC	monthly
	TSS, pH, total manganese, total iron	monthly (per NPDES Permit No. PA0593508)
	Mine pool level	⁶ daily (to continue during mine pool recovery period)
	Erosion, conveyance swale & culvert	inspect annually, prior to startup
Still Creek Reservoir	Flow	⁶ daily (during times of use)
	⁹ Dissolved oxygen	weekly (during times of use)
	Reservoir level	⁶ daily (during times of use)
Still Creek (one station vicinity Rt. 309)	Temperature	continuous (during times of use); reported as daily average
	Flow	weekly (during the project season)
	pH, dissolved oxygen, conductivity, alkalinity, TDS	monthly during temperature data download (during times of use)
Little Schuylkill River (three stations, one above & two below Still Crk.) (two stations, one above & one below Still Crk.) (two stations, one above & one below Still Crk.) (one station vicinity Pine Crk. confluence)	Temperature	continuous (during times of use); reported as daily average
	Flow	weekly (during the project season)
	pH, dissolved oxygen, conductivity, alkalinity, TDS	monthly during temperature data download (during times of use)
	Fish (with temperature, pH, dissolved oxygen, conductivity, alkalinity)	spring, summer, fall (conditions permitting)
Pottstown Water Department (Sch. R. intake)	Conductivity	twice weekly by Pottstown
	pH	⁶ daily by Pottstown
	TDS, total manganese, total iron, TOC, sulfides	² twice/weekly for the first two weeks (when flow at Pottstown gage <840 CFS)
PA American (Sch. R., Spring City intake)	TDS	monthly (weekly when flow at Pottstown gage <560 CFS)
East Branch Perkiomen Creek	Temperature, dissolved oxygen, E. coli, fecal coliforms	five times per month (during the demonstration periods)
	^{4,7} Biological	benthos - two samples - one in July or August and one in November (conditions permitting) fish - one sample in October or November (conditions permitting)
	⁸ Erosion and sedimentation	at end of pumping season
Perkiomen Creek (Graterford)	Temperature, dissolved oxygen, E. coli, fecal coliforms	monthly
Schuylkill River longitudinal survey	Temperature, pH, dissolved oxygen	monitoring events, when flow is < 1,791 CFS, only during 2005
Black Rock Pool	Temperature, pH, dissolved oxygen	³ once per hour on a continuing basis at temperatures > 59° F and flows <1,791 CFS
Norristown Pool	Temperature, pH, dissolved oxygen	³ once per hour on a continuing basis at temperatures > 59° F and flows <1,791 CFS
LGS Intake (Sch. R.)	Temperature, pH, dissolved oxygen	³ once per hour on a continuing basis at temperatures > 59° F and flows <1,791 CFS
Schuylkill R. (Linfield Bridge)	Temperature	daily by LGS
Schuylkill R. (USGS Stations) four stations Landingville Vincent Dam		
	Flow	daily from USGS
	Rainfall	daily from USGS
	Dissolved oxygen	as available from USGS
⁵ Schuylkill R. (upstream and downstream of Norwegian Crk.)	⁴ Biological (with temperature, TDS, pH, dissolved oxygen, conductivity, alkalinity)	monthly when pumping (conditions permitting) ¹⁰
	Temperature	continuous; reported as daily average
Norwegian Crk. (upstream of confluence with Schuylkill R.)	Temperature, pH, dissolved oxygen, conductivity, alkalinity, TDS	monthly when pumping during Schuylkill R. biological sampling ¹⁰
	Temperature	continuous; reported as daily average

Notes:¹ during operational periods of the demonstration project unless otherwise noted.² frequency and flow trigger for Pottstown Water Department monitoring may be modified after one season of monitoring results.³ conditions permitting, data retrieved weekly; monitoring equipment may be removed for protection when stream conditions warrant and reinstalled when safe conditions return⁴ fish and benthic invertebrates⁵ biological monitoring locations are PA Fish & Boat Commission historic sampling site 106 just upstream of the Rt. 61 Bridge and Norwegian Creek confluence at Pottsville [Schuylkill R. mile 123.6] and site 109 approximately 32 yards upstream of the Cressona Mall Bridge off Rt. 63 [River mile 120.1]⁶ daily monitoring will be based on business days (five days per week excluding holidays).⁷ benthic monitoring stations are E36725 (Elephant Rd.), E29910 (Callowhill Rd.), E23000 (Cathill Rd.), and E12500 (Moyer Rd.); electrofishing locations are E36300 (Elephant Rd.), E30700 (Callowhill Rd.), E22240 (Cathill Rd.), and E1637 (Garges Rd.) - number after E is distance in meters between downstream end of sampling point and stream mouth⁸ at selected historical locations⁹ in discharge to Still Creek below reservoir¹⁰ quarterly starting with the 2006 pumping season.